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Single spin relaxation measurements in Si/SiGe quantum dots[1]

T. M. HAZARD, D. M. ZAJAC, X. MI, J. R. PETTA, Department of Physics, Princeton University — Spin qubits fabricated in silicon hold great promise for quantum computing due to their long relaxation and coherence times. We measure the spin relaxation time, T_1, as a function of in-plane magnetic field, B, in undoped accumulation-mode Si/SiGe quantum dots. Using single shot measurements[2], we measure $T_1 = 170$ ms at $B = 1$ T. In the limit where the Zeeman energy is much greater than the valley splitting, $E_z \gg E_v$, we find that T_1 scales as B^3. Using a large linear array of dots[3], we are able to measure differences in the relaxation rates for adjacent dots in the same device and find a similar power law scaling in 4 dots. By changing the size of the dots, we find no substantial difference in the relaxation rate when the orbital energy of the dot is changed by an order of magnitude. Spin relaxation hot spots[4] are observed at small magnetic fields in 2 of the 4 measured dots, giving further evidence that the valley splitting is small in these devices.

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[2]J. M. Elzerman *et al.*, Nature, **435**, 431 (2004).
[3]D. M. Zajac *et al.*, Phys. Rev. Appl. (in press).
[4]C. H. Yang *et al.*, Nat. Comm., **4**, 2069 (2013).

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